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Dekker, R; van der Sluis, CK; Groothoff, JW; Eisma, WH; ten Duis, HJ

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Long-term outcome of sports injuries: results after inpatient treatment

R Dekker, CK van der Sluis Department of Rehabilitation Medicine, University Hospital Groningen, Northern Centre for Health Care Research, University of Groningen, **JW Groothoff** Northern Centre for Health Care Research, University of Groningen, **WH Eisma** Department of Rehabilitation Medicine, University Hospital Groningen, Northern Centre for Health Care Research, University of Groningen and **HJ ten Duis** Department of Surgery, section Traumatology, University Hospital Groningen, The Netherlands

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Objective: To investigate whether sports injuries result in long-term disabilities and handicaps and to establish variables with a prognostic value for the occurrence of these long-term consequences.
Materials and methods: All patients older than 17 years of age and admitted to the University Hospital Groningen because of a sports injury were entered in the study. By filling in a questionnaire 1–4 years after the injury an inventory was made of the long-term consequences.
Main outcome measures: Absenteeism from work and sports, experienced disabilities or handicaps and the Sickness Impact Profile 68 (SIP68).
Results: Out of 306 patients 229 (75%) returned a completed questionnaire. Sixty-seven per cent of the working population had been unfit for work up to one year, whereas 4% still had not resumed work. Absenteeism from sports was also considerable; nearly half of the population did not participate in sports for more than a year. Furthermore, 32% of the patients still experienced disability or handicap following the injury. This finding is in agreement with the results of the SIP68 (odds ratio 6.8; confidence interval (95% CI): 3.51–13.08). Two prognostic variables could be distinguished: 'gender' and 'type of sport'. Long-term consequences occur more often in women ($p < 0.03$) and with playing outdoor soccer, horse riding or skiing ($p < 0.01$).
Conclusions: Sports injuries can lead to long-term disabilities and handicaps. The variables 'gender' and 'type of sport' were of prognostic significance.

Address for correspondence: R Dekker, Department of Rehabilitation Medicine, University Hospital Groningen, PO Box 30.001, 9700 RB Groningen, The Netherlands. e-mail: R.Dekker@rev.azg.nl

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Introduction

Participation in sports is a popular way of spending spare time. Forty per cent of the Dutch population practise some form of sports.[1] A notable side-effect is the occurrence of a large number of injuries. In the Netherlands (16 million inhabitants), for instance, 2.9 million sports injuries happen annually, of which 209 000 have to be treated in hospital. These hospital-treated sports injuries are only outnumbered by injuries due to home and leisure accidents, but exceed the number of injuries following traffic accidents or violence.[2] In this context the term 'sports injury' refers to an injury resulting from participation in sport and needing hospital treatment. Apart from the consequences the sports injury may have for the individual patient, such as disability or handicap,[3] it is to be expected that such large numbers will also have implications for society in terms of need for medical care and costs. The latter not only concern direct costs following medical treatment but also indirect costs generated by the need for social services. For example, the injuries cause considerable absenteeism from work immediately after the accident.[1,4–6]

Long-term consequences are described only by a circumscribed number of studies.[4,7–15] Most of these studies address only some of the disabilities and handicaps[2] or focus primarily on impairments,[13-15] children,[13] one type of sport[14] or one specific body region.[15] To be able to weigh the significance of sports injuries in terms of long-term consequences it is important to gain insight into the broad spectrum of residual disabilities and handicaps (as defined in the International Classification of Impairments, Disabilities and Handicaps, the ICIDH[3]) due to the various sports injuries.[16,17] This is in line with Shapiro *et al.*[16] who stated that the use of generic health assessment measures in the studies of sports injuries, alongside traditional measures, is of the utmost importance in order to demonstrate the true value of treatment of sports injuries to policy makers. In this respect, severe sports injuries are probably more likely to cause long-term consequences than less severe injuries, and the need for hospital admission may serve as a criterion for injury severity.[2] We recognize that less severe injuries (for example repetitive strain injuries) may also have an enormous impact, but this is not investigated by this study.

The objective of this study is to analyse whether severe sports injuries (requiring hospital admission) lead to long-term disabilities and handicaps.[3] Furthermore, we aim to predict which variables influence the prevalence of these long-term consequences, since previous research[7–11] revealed a prognostic value for a number of variables, such as age, gender and type of injury, in relation to short-term consequences of sports injuries but not in relation to a broad spectrum of disabilities and handicaps in the long term.

Materials and methods

In the city of Groningen (169 000 inhabitants) and the surrounding region (2.5 milion inhabitants) the University Hospital Groningen (UHG) plays a major role as emergency care centre for trauma victims. Annually 9980 patients register[2,18] at the emergency unit of the Department of Traumatology of the UHG, 17% (1730) of which are as a result of participation in sport. The admission rate of patients with an injury due to sports participation was 7.9%. After approval by the medical ethical board of the UHG all patients older than 17 years of age and admitted because of a sports injury between January 1995 and January 1998 were entered in the study. Using patient records data were collected concerning age, gender, Injury Severity Scale (ISS; an overall injury severity score,[19]), cause of injury, type of injury, body region, length of hospital stay and treatment.

In order to investigate the long-term consequences of sports injuries after inpatient treatment the patients were sent a questionnaire containing items about absenteeism from work and sports participation. The patients were also asked: 'Do you still experience disabilities or handicaps following the sports injury?'. In addition the Sickness Impact Profile 68 (SIP68) was applied as outcome measure in the field of disabilities and handicaps. The SIP68 is a reliable, valid and above all short generic version of the Sickness Impact Profile measuring functional status.[20–24] It consists of 68 items, subdivided into six

categories, about health-related behavioural problems reflecting the physical, mental and social dimensions of functional status. The subscales 'somatic autonomy', 'mobility control', 'emotional stability' and 'psychological autonomy and communication scales' may be considered to represent the level of disabilities. The subscales 'mobility range' and 'social behaviour' relate to the ICIDH[3] concept of handicap.[22] The minimum sumscore is '0', the maximum '68'. Higher scores indicate poorer functional health status.[3] Data on reference populations are available.[20–24] Personal communication with the compilers of the SIP68 revealed that a result of '0' versus 'greater than 0' can be considered as a relevant functional difference. In addition the questionnaire contained supplementary items covering the injury and the sport participation.

Statistical analysis was performed using SPSS version 9.0. Descriptive statistics were employed to determine the prevalence of long-term disabilities and handicaps. The Z test for the equality between two proportions (binominal proportion) was performed to measure responders against nonresponders. One-sample t-tests were used to compare the results of the SIP68 with a frame of reference. In order to determine the prognostic value of a set of variables (age, gender, type of injury, body region, ISS score, level of education, type of sport, level of sports participation, length of hospital stay and treatment) logistic regression analysis was performed with the dichotomized result of the sumscore of the SIP68 ('0' versus 'greater than 0') as the dependent variable.

Results

Between 1995 and 1998 306 patients older than 17 years of age were admitted to the UHG because of a sports injury. These patients were sent a questionnaire. 61 patients (20%) could not be contacted and 16 (5%) were not willing to participate, resulting in a response rate of 75% (229 of 306). The mean time since the accident in the responder population was 2.8 years (SD 1) with a range of 1–4 years.

Basic characteristics, responders and nonresponders

There were no significant differences between responders and nonresponders concerning age and gender distribution, ISS score, length of hospitalization, cause of injury and nature of treatment. Some discrepancies were noted regarding the type of injury and the body region (Table 1).

About one-third of the responders (32%) were highly educated (university or higher vocational education), 49% had an intermediate level education (high school or intermediate vocational education) and 19% had received a low education, either no education, only elementary school, or at most, lower vocational education. These data do not differ from the corresponding percentages (28%, 50% and 21% respectively) in the general Dutch population.[25]

Half the responder population (49%) participated competitively in sport. The largest number of sports injuries (69/229: 30%) occurred while playing soccer (Table 2) and horse riding accounted for the second largest number of injuries (30/229: 13%).

Outcome measures

At the time of their accident 74% (169) of the patients were employed. Five per cent of this working population did not experience any absenteeism but 67% had not been able to work for up to one year (Table 3). The latter percentage is not only an indication of the severity of sports injuries but probably also an indication of the nature of the social security system in the Netherlands. Four per cent of the population was still unfit for work due to the sports injury at the time of the interview.

Absenteeism from sports occurred in 96% of the patients. Nearly half of this population (Table 3) were not able to participate in sports for more than a year.

Thirty-two per cent (73) of the population stated that, after an average time since accident of 2.8 years, they 'still experienced disabilities and handicaps following the sports injury'. This finding is in accordance with the results of the SIP68 mentioned below (odds ratio 6.8; 95% confidence interval (95% CI) 3.51–13.08).

The results of the SIP68 are listed in Table 4. In order to weigh the significance of this outcome

a comparison is made with the results of two reference populations: patients with a spinal cord injury (SCI) and patients with neck and back complaints.[22] The SIP68 score was calculated for all three populations. As far as the sumscore and all of the subscores are concerned, patients with a sports injury had a significantly lower score compared with the SCI patients but there was no significant difference with the population of patients with neck and back complaints. Further,

Table 1 Basic characteristics of responders, nonresponders and total population

	Responders	Nonresponders	Total
Number of patients	229 (75%)	77 (25%)	306 (100%)
Age (mean/SD/range)	32/10/52	30/11/56	31/10/58
Gender (% male, number)	75% (n = 172)	78% (n = 60)	76% (n = 232)
ISS (mean/SD/range)	4.8/4.1/37	4.9/4.1/17	4.8/3.8/37
Cause of injury (number, %)			
Fall	98 (43%)	33 (43%)	131 (43%)
Collision with or kick by opponent	23 (10%)	7 (9%)	30 (10%)
Sports material	16 (7%)	3 (4%)	19 (6%)
Other (e.g., stumbling)	92 (40%)	34 (44%)	126 (40%)
Type of injury (number, %)			
Fracture	128 (56%)	37 (49%)	165 (55%)
Soft tissue injury	78 (34%)	34 (44%)	112 (36%)
Internal injury	14 (6%)	2 (2%)	16 (5%)
Intracranial injury	9 (4%)	4 (5%)	13 (4%)
Body region (number, %)			
Head/neck	14 (6%)	7 (9%)	21 (7%)
Thorax/abdomen	18 (8%)	2 (3%)	20 (6%)
Spine	18 (8%)	2 (3%)	20 (6%)
Upper extremity	34 (15%)	17 (22%)	51 (16%)
Lower extremity	145 (64%)	49 (64%)	194 (63%)
Length of hospitalization in days (mean/SD/median/range)	9/11/6/123	9/8/6/43	9/10/6/123
Treatment (%) (operative versus conservative)	76%/24%	80%/20%	77%/23%

ISS, Injury severity score.[19]

Table 2 Number of patients per type of sport

	Number of patients		
Type of sport	Total (%)	Female (%)	Male (%)
Soccer (outdoor)	69 (30%)	2 (3%)	67 (42%)
Horse riding	30 (13%)	25 (36%)	5 (3%)
Speed skating	16 (7%)	4 (6%)	12 (7%)
Volleyball	16 (7%)	6 (9%)	10 (6%)
Skiing	14 (6%)	5 (7%)	9 (6%)
Motorcross	11 (5%)	–	11 (7%)
Soccer (indoor)	9 (4%)	–	9 (6%)
Handball	9 (4%)	4 (6%)	5 (3%)
Basketball	5 (2%)	2 (3%)	3 (2%)
Martial arts	4 (2%)	2 (3%)	2 (1%)
Cycle-racing	4 (2%)	–	4 (3%)
Badminton	4 (2%)	4 (6%)	–
Korfball	4 (2%)	4 (6%)	–
Rest	34 (14%)	11 (16%)	23 (15%)
Total	229 (100%)	69 (100%)	160 (100%)

Table 3 Absenteeism from work and sports due to the sustained sports injury

	1995 (n = 59)	1996 (n = 49)	1997 (n = 61)	Total (n = 169)
Absenteeism from work (number of patients)				
<1 month	12 (20%)	16 (32%)	21 (34%)	49 (29%)
1 month–1 year	43 (73%)	33 (68%)	38 (61%)	113 (67%)
Permanent	4 (7%)	–	2 (3%)	7 (4%)
Absenteeism from sports (% with absenteeism, number of patients)	77 (96%)	63 (95%)	79 (95%)	219 (96%)
<1 month	–	1 (2%)	6 (7%)	7 (3%)
1 month–1 year	38 (49%)	30 (49%)	41 (53%)	109 (50%)
>1 year	36 (47%)	29 (46%)	31 (40%)	96 (44%)
Unknown	3 (4%)	3 (4%)	1 (1%)	7 (3%)

Table 4 Results of SIP68: reference populations: patients with a spinal cord injury (SCI)[23] and patients with neck or back complaints[23]

SIP68	Sports injuries (n = 229)	SCI (n = 41)	Neck/back complaints (n = 338)
Subscales:			
Somatic autonomy	0.4	6.5	0.2
Mobility control	1.2	6.6	1.0
Emotional stability	0.6	0.8	0.4
Psychological autonomy and communication scales	0.7	1.1	0.7
Social behaviour	1.7	4.6	1.6
Mobility range	0.1	2.6	0.2
Sumscore	4.7	22.3	4.1

SIP68, Sickness Impact Profile 68.

24% of the patients had a sumscore 'greater than 0', indicating some residual disability or handicap following the sports injury. This primarily concerned the subscales 'social behaviour', 'mobility control' and 'emotional stability'. The remainder (76%) of the population were not suffering from long-term consequences following the sports injury at the time of the interview.

After performing logistic regression analysis only gender ($p < 0.03$) and type of sport ($p < 0.01$) proved to be of prognostic significance. Long-term consequences of sports injuries occur more often in women and with horse riding, outdoor soccer and skiing.

The other variables mentioned in Materials and methods had no significant prognostic value for the occurrence of long-term consequences of sports injuries.

Discussion

Little is known about the long-term outcome for patients with a sports injury nor how many of them have residual disabilities and handicaps. Such information is important in order to get insight into the consequences of these injuries for both patients and society, as it is reported that a large number of patients are treated annually in hospital due to these injuries.[2] Almost all of them belong to the working population.

Therefore, all patients with a severe sports injury (needing hospital admission) and older than 17 years of age (n = 306) were selected from the total number of patients with a sports injury (n = 5190) treated in the UHG over a three-year period. By using hospital admission as a selection criterion the results and conclusions of this study

Clinical messages

- Inpatient-treated sports injuries may well lead to long-term consequences.
- These consequences not only concern absenteeism from sports participation and long-term absenteeism from work but also lasting problems in the overall functional status of the patient.
- Inpatient-treated sports injuries in women and injuries following horse riding, outdoor soccer or skiing cause proportionally more long-term consequences.

are valid for comparable populations but they are not applicable for patients with a sports injury treated otherwise or not treated at all. Residual disabilities and handicaps following a sports injury were measured, amongst others, by making an inventory of the absenteeism from work. The burden of the long lasting (for several months) payment of benefits to two-thirds of the population who were employed at the time of the accident gives an indication of both individual handicap and the financial consequences of sports injuries to society. Even to a higher degree this goes for the continuing payment to 4% of the total population and even to 7% of the population injured in 1995 (Table 3). This is further underlined by the fact that the costs generated by one year of absenteeism from work amount, on average, to 27 000,[26] and that the research population is young; therefore a large number of potential laborious years are lost. The percentage of patients permanently out of work is lower with patients injured in 1996 and 1997 in relation to patients injured in 1995 (Table 3). A possible explanation for this difference is the change in legislation in the Netherlands in the year 1996 whereby the conditions on which someone is declared unfit for work became more strict. Also improvement of the labour market may have contributed.

Another measure for long-term consequences of sports injuries is the sporting time lost. The vast majority of the research population (96%) had to refrain from sports participation for some time due to the injury. It is a noteworthy that nearly half of the population was not able to participate for more than a year. Not being able to participate in sports is known to be an important psychosocial influence,[27] which may be manifest after an absenteeism of only 3–4 weeks,[28] let alone after one year. One should realize, however, that admission itself (entry criterion in this study) will be a reason for absenteeism from work or sports.

Long-term consequences of a sports injury, as measured by absenteeism from work or sports, are not only determined by the severity of the injury; psychosocial factors may also play an important role, like the (lack of) contentment in working or in participating in sports. It even can be argued that giving up a sport is a sensible choice rather than an inevitable consequence of the injury.

The SIP68 is a more objective measure to weigh long-term consequences. The results of the SIP68 reveal that 24% of the patients scored 'larger than 0', indicating some long-term consequences. This finding coincides with the fact that 32% of the patients stated 'they still experienced some disabilities or handicaps, 3 years after the injury'. The difference in percentages may well be explained by a possible sloppiness in filling out the SIP68 form. Although the dichotomy '0 – larger than 0' may seem disproportionate it is not only in the experience of the composers of the SIP68 that it is relevant, but also its relevancy is underlined by the weight attributed to results of the SIP136, the extended version of the SIP68 consisting of 136 questions. Already a seemingly low score on this SIP136 corresponds to some degree of disability: 0–8 out of 136 (Patrick[29]), 0–9 out of 136 (Bergner[30]) and 6–9 out of 136 (Gilson[31]).

The mean sumscore of the SIP68 was 4.7. The relevance of this result can be elucidated by comparing it with the results in reference populations. It becomes clear that the level of disabilities and handicaps in patients with a sports injury is comparable with the level in patients with neck and back complaints. A demonstration of the impact of low back complaints is the fact that its lifetime prevalence is 50–80%[32] and that in the Netherlands 35% of the budget for illness and disablement benefits is spent on this patient category.[33] The mean sumscore of the SIP68 in the popula-

tion of patients with a sports injury is significantly lower than in the population of SCI patients.

The variable 'gender' turned out to be of prognostic significance: women are more prone than men to experience long-term consequences of a sports injury. In part this can be explained by the finding that relatively more women suffer from an injury due to horse riding. This activity incurs disability or handicap significantly more often than other types of sports. Other studies subscribe to these findings.[34–37]

An explanation for the fact that only two prognostic variables could be distinguished may be the limited uniformity concerning the variables 'body region' and 'type of injury'.

From a study concerning sports injuries not needing inpatient treatment (unpublished data) it becomes clear that these injuries can also cause long-term disabilities and handicaps. On average these consequences are less severe than in inpatients: for example, the per centage of outpatients not resuming sport is 11%; in inpatients 44%. Furthermore, 20% of the outpatients still experience disability or handicap following the injury versus 32% of the inpatients.

Conclusions

The results of all four of the applied measures: (1) absenteeism from work, (2) absenteeism from sports participation, (3) the question 'Do you still experience disabilities and handicaps following the sports injury', and (4) a generic measurement instrument (the SIP68) show that severe sports injuries lead to long-term disabilities and handicaps. The injuries and above all their long-term consequences are not only a burden for the patients involved but also incur substantial direct and indirect costs and need for medical health care.

Two variables ('gender' and 'type of sport') with a prognostic value concerning the appearance of long-term consequences could be distinguished. Therefore prevention and treatment strategies should be aimed at the broad spectrum of patients with a sports injury, with a predominance for women and injuries due to horse riding, outdoor soccer and skiing.

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